

NEWS



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

TELS. WO 2-4155
WO 3-6925

FOR RELEASE:

UPON DELIVERY
October 29, 1968

Address
by
James E. Webb, Administrator
National Aeronautics and Space Administration

New York Council
of the
Navy League of the United States
New York, New York
October 29, 1968

Good evening, friends of the United States Navy.

Thank you for this opportunity to be with you tonight to honor our Navy, its leaders, and NASA's 17 Navy Astronauts who are represented here tonight by a Naval Academy graduate who is also an Air Force astronaut, Lt. Colonel James B. Irwin.

These 17 men are Naval aviators and test pilots. They represent the fact that just as our nation's accomplishments in aviation over the years have proceeded hand-in-hand with the development of its naval power, both now proceed hand-in-hand with space power.

The Navy was important in aeronautics from the beginning. It was through a rider on a Navy appropriations bill that the National Advisory Committee for Aeronautics was formed in 1916. This was 13

years after the Wright Brothers' flight and 12 years after your New York Council of the Navy League was formed. Under NACA the U.S. created a unique means through which scientific knowledge of the earth's atmosphere, and research and development in new ways to use it, could go forward together. For 42 years the Navy and the NACA worked in the closest association, with the result that the joining of naval air and sea power made the aspirations of this nation for a peaceful and developing world a force to be reckoned with.

At the end of this 42 years, at the beginning of the Space Age, our nation decided to expand on this successful pattern. It established the National Aeronautics and Space Administration to apply the successful NACA way of working to problems in a much larger area, that would expand outward from the surface of the earth that includes both air and space. That was in 1958.

During its first ten years NASA brought together a work force of over 400,000 men and women, 10% of whom were construction workers putting in place a three billion dollar addition to our capital investment in test and launch facilities, vacuum chambers, centrifuges and new simulators. Under NASA management, as many as 20,000 industrial contractors and thousands of researchers on the campuses of 150 universities were put to work. For a number years, 90 to 95% of NASA's dollars went to pay non-government workers.

A complete family of efficient space boosters, three to four generations of spacecraft, and many advanced aeronautical vehicles were designed, built, and flown. Every major area of aeronautical and space research was driven ahead.

In this first decade of NASA, as in the 42 years of NACA, the Navy has played a leading role. The Office of Naval Research was early in the rocketry game, as this new technology revealed its potential. It was in the Office of Naval Research that Dr. Homer Newell, NASA's Associate Administrator, developed his space know-how and that of his Space Science and Applications group. NASA benefited greatly when Dr. Newell and his unit were transferred to it from the Navy in 1958. The Navy's spectacular successes in recovering astronauts seem at times to obscure some of our more fundamental Navy-NASA relationships.

A major NASA effort has been to systematize the means through which scientists doing research at our universities could relate their studies of the solar system to the new opportunities for the use of rockets, and also to the nation's continuing need for training the next generation of scientists and engineers. Almost 10,000 personnel on our university campuses have been involved in this process, and their effectiveness has been immeasurably greater because we were able to apply and build on ONR policies. After the war, in the period before

the National Science Foundation was created, the Office of Naval Research carried forward a far-sighted plan for the support of basic research in our universities. It is not likely that the full measure of this contribution by the Navy will ever be widely understood, but I can state tonight that NASA's effort to rapidly join the university groups working in aeronautics with those working in space would have taken a great deal longer and cost a great deal more except for this pioneering work by the Office of Naval Research.

Does the Navy League know why leaders in the United States Navy could see this fundamental basic research need and find an effective way to meet it when no civilian agency and no other military service did so?

It may well be that the basic training of generations of naval officers has taught them to think of their fundamental role broadly, and as always serving as representatives of the United States beyond its borders, in peace as well as war. Navy leaders have had to work in areas where sovereignty and other concepts which determine and control national policy and action within our borders take on a different character and more and more our nation will face problems in these complex and different new areas. It is certainly true that the challenges of technological advances to the requirements of sea warfare have forced Navy engineers to design and handle light-weight flexible structures in a different

manner than was required for massive fortress walls and other types of land construction. The naval man's emerging understanding of the use of ribs and planks, spars and rigging, sails and rudders led to the harnessing of wind and water power ashore, and the construction of man's first machinery. Electric lights and power were first used afloat, as was mechanical refrigeration, computers for fire control, radio communications, and hydraulic drive systems. We know today that this kind of pioneering has moved our navy into new dimensions as the requirements of aviation, and now of space, have led to the fully engineered, thin-wall structure, the use of very high temperatures and pressures, microwave radar, nuclear energy, synthetic materials, antibiotic drugs, jet and rocket propulsion, and solid state electronics.

NASA has also had to pioneer on a fast-moving frontier. In the field of communications spacecraft, NASA has already moved through five generations of experimental satellites -- from Echo through Relay, Telestar and Syncom to Applications Technology Satellite III which is over the equator near the mouth of the Amazon River, sending back a picture every 20 minutes in color of an area extending from the Rocky Mountains to the Alps and from Greenland to Antarctica. When the pictures are analyzed, the valuable weather information is sent back to the same area by using the same satellite as a radio relay. We

have also helped convert the knowledge from these experimental machines into the operational satellite systems now used by the Department of Defense and the Communications Satellite Corporation.

This is the same process utilized as NASA has moved rapidly through the development of three generations of experimental meteorological satellites and at the same time assisted in the development of the operational systems of the Environmental Sciences Service Administration.

To further illustrate the point, in ten years NASA has moved through three generations of manned spacecraft from Mercury through Gemini to Apollo.

Let me turn now to another major development in which the Navy and NASA are engaged. This is the development of new types of management capability for large-scale organized efforts in science and technology and the kind of institutional interaction which we have both found essential. NASA's expert in this field is Admiral Charles Weakley, who retired from the post of Commander, Anti-Submarine Forces, U.S. Atlantic Fleet, last December. His job is Assistant Administrator for Management Development.

In the field of management just as in the fields of boosters and spacecraft NASA has moved through several generations. Apollo is using a third-generation management system built on our experience with the first two generations. We had hardly completed the bringing into NASA of the Vanguard group from the

Office of Naval Research, the von Braun group from the Army Ballistic Missile Command, the Centaur and the other projects from the United States Air Force, and the Jet Propulsion Laboratory of the California Institute of Technology, when the expansion called for by President Kennedy after the Gagarin flight required new management structures. We had hardly digested the impact of these 1961 second-generation changes when, in 1963, a third-generation pattern was required. We undertook a fourth at the time of the death of Dr. Hugh Dryden in 1965. Now, Dr. Paine and Admiral Weakley are perfecting a fifth-generation structure which is required because the Agency is completing the missions which were planned and funded in the early 1960's and looking forward to the new programs in the post-Apollo period that will utilize and extend our space capabilities.

In developing its management as well as its engineering systems, NASA is working closely with the Navy and the Chief of Naval Operations, Admiral Thomas Moorer, who has associated his entire senior staff group with NASA in those areas where new space capabilities can contribute greatly to the solution of problems faced by the Navy. Both NASA and the Navy are finding that in many areas of technology, hardware, human factors, structures, navigation, guidance and control, materials, sensors, life support systems, atmospheric mixtures, reaction to stress and close confinement, work and rest cycles, there are many

elements in common for undersea operations and for space operations.

In spite of Wally Schirra's statement that the Apollo 7 was a "lousy boat," what the Navy has learned from Apollo and what NASA has learned from advanced undersea operations, including Scott Carpenter's work in the SEALAB III project, is of the utmost value to both.

In advancing our understanding of interaction between the oceans and the atmosphere, both the Navy and NASA are working with other national and international agencies in an experiment called the Barbados Oceanographic Meteorological Experiment. This will cover a three hundred nautical mile quadrangle east of the island of Barbados and extend over three months in the spring of 1969. Synoptic and sequential measurements will be taken from the bottom of the sea at two to three thousand fathoms, upward to nearly a hundred thousand feet in the atmosphere. This BOMEX experiment is of unprecedented comprehensiveness. NASA will handle the data processing at its Mississippi Test Facility, and the knowledge from both the measurements and the system for managing the experiment may well lead on to other large scale, perhaps global, geophysical experiments. Satellite data collection and satellite remote sensing will undoubtedly prove vital components of such future experiments and lead to further close cooperation between the Navy and NASA.

As I emphasized earlier, ten years ago, in the National Aeronautics and Space Act of 1958, a wise decision was made to join the development of space know-how to the NACA system for the development of know-how in the use of the air. Thus aviation and space were not compartmented but NASA could work with the whole continuum that reached upward through the air and outward into space. The knowledge derived from each element served the entire continuum. The organizational problems were thus minimized.

How does this air-space experience relate to our nation's newly emerging opportunities and requirements in oceanography? Admiral Weakley tells me that although we have made tremendous advances in our knowledge of subsurface conditions, we still know very little compared to what we must learn. I remember his illustration that as recently as 1951 in Webster's Unabridged Dictionary, "oceanology" was not listed, except at the bottom of a page among the "little used words" and is there given a one-word definition "oceanography." As to oceanography itself in 1951, two sorts are listed: static and dynamic. In this same edition, there are voluminous definitions for geography and geology and the disciplines involved in both.

Ten years later, in the 1961 edition, oceanography has increased to three types: static, dynamic and biological. Further, oceanology is listed in the category of "common words" but is still defined by that one word "oceanography."

The American Assembly of Columbia University has just published a report entitled "Uses of the Seas." In a foreword, Dr. Julius A. Stratton, former president of the Massachusetts Institute of Technology, and now Chairman of the President's Commission on Marine Science, Engineering and Resources, and Chairman of the Ford Foundation, states that "There can hardly be a shadow of doubt that a wholly new era in the use of the seas lies immediately before us." In his introduction, entitled "New Horizons at Sea," the editor of this report, Dean Edmund A. Gullion of the Fletcher School of Law and Diplomacy at Tufts University, and a former distinguished foreign service officer and member of the Policy Planning Staff of the State Department, uses these words:

"Ocean technology has reached no plateau; if anything, the pace of change is accelerating. The result, so characteristic of this age, is that we must be as much or more concerned with predicting the technology of tomorrow and its imperatives for policy as we are with managing existing technology."

Turning from technology to naval matters, let me quote again from editor Gullion:

"The missions of the world's war fleets, the terms of their confrontation, and the composition of their forces, are continuously modified by the world's increasing use of the sea, by competition to exploit the sea bed for military and civil purposes, and by developments in electronics, ship construction and weaponry. The undersea environment will be the locus of new forms of military effort."

Gullion does not say how the fast pace of technological development in aeronautics and space will add to the accelerating pace in ocean technology and also affect the international balance of power. But just as in 1958 the continuum of air and space was considered an undivided region within which science and technology should be driven ahead, in 1968 we can see many advantages in considering the entire region from the bottom of the sea outward into space as a continuum. How to organize our efforts to take advantage of this concept is a major challenge that will continue to occupy the best talents of both Navy and NASA leaders, as well as those in many other agencies.

Earlier I spoke of the development and use of several generations of spacecraft to develop our national capability in each major field. As an example of how our lunar effort gives us a capability to reach out to other bodies in space, far beyond the Moon, let us review the way we went about it. To measure and understand conditions on the Moon, NASA used three generations of unmanned lunar explorers. The first, Ranger, crashed into the Moon and provided detail one thousand times more accurate than the best astronomers had obtained from ground-based telescopes. The second generation, Surveyor, landed on the

Moon and multiplied the accuracy of the detail by another factor of a thousand -- giving a total increase in accuracy from Ranger and Surveyor by a factor one million. These first two generations of lunar spacecraft are well known. Their pictures came back live from the Moon. Millions saw Surveyor digging holes on the Moon and analyzing the composition of the lunar surface. What is not so well known is that the third generation was put in orbit around the Moon. Named Lunar Orbiter, it made five successful flights and gave us very accurate maps of the entire surface of the Moon, both the front and back. This Lunar Orbiter project tied together all the previous information about the Moon, and it was managed by a retired Naval officer, Captain Lee Scherer. Scherer has now transferred from the automated scientific exploration of the Moon over to the Apollo program for the manned flights that are soon to come. He is an example of many outstanding scientists, engineers, and managers working in NASA, using the knowledge and skills acquired in a Naval career and feeding back to their colleagues in the Navy these very advanced technologies and capabilities. He is an example of a national asset that the Navy can use in developing its programs in oceanography.

I wish I could name all of the outstanding Navy men in NASA and recognize their accomplishments. I wish I could cover the full range of Navy astronauts, 17 in all. Time does not permit, but I do want to say that through the leadership of three great

Chiefs of Naval Operations, Admiral Anderson, Admiral McDonald and Admiral Moorer, and three generations of recovery task force commanders in the Mercury, Gemini and Apollo programs -- a total of thirteen task forces commanders -- the rapid advance from generation to generation in space exploration has been an example of what the best in our nation's military leadership can and will do when given the assignment.

In NASA's formative years a very important assignment was given to Admiral Fred Boone, USN, Retired. It was his responsibility to handle the area of relationships with all elements in the Department of Defense. Drawing on his high personal qualities and his long experience as a Naval officer and Naval aviator, and his more immediate experience as U.S. Representative, NATO Standing Group and Military Committee, Admiral Boone was instrumental in forging close and effective relationships between NASA and all the military services. Just as Captain Scherer's outstanding service can hardly be as well known as that of Captain Schirra, neither can that of Admiral Boone, but I can say that every Navy man in NASA has shown the greatest ability in projecting into the mastery of the new and hostile environment of space the organizational, engineering, and scientific knowledge and understanding which the Navy has provided. This is the pattern which members of the Navy League can expect the Navy and NASA to follow in the years to come.

But let me make clear that all is not completely cozy.

Apollo Mission Control has a slight argument with the Navy. It claims Apollo 7 came down 700 yards from its target point. Now, we all know the Essex was a few miles away. But it is more important to examine the views of the man responsible for the accuracy of the Apollo Guidance System than to continue this argument. He is Dr. Charles Draper of MIT and here are his words:

"Nations, individuals and mankind in general work together better and find greater rewards in living when imagination is stimulated by bold endeavors of compelling common concern. Throughout history whole societies have been inspired toward tremendous activities that have often involved great sacrifices, and sometimes have brought spectacular results. Central themes based on national pride and desires led Greece, Rome, England, and many others to positions of eminence in culture, strength, and material wealth as they pursued goals of learning, power, exploration and social well being. Great things occurred when a whole people were inspired to work together toward some clearly visible high place of achievement.

"Success in space exploration became such a high place when our country, under the sting of pioneering successes in space by the Soviet Union, accepted President Kennedy's

challenge to place men on the moon. To accomplish this, it was obvious that spectacular advances in technology would have to be forced in terms of performance and reliability of equipment. These great advances on the necessarily tight schedules were clearly beyond the capabilities of any existing industrial or government organization. The National Aeronautics and Space Administration was set up to carry out the Herculean tasks associated with a manned lunar landing. The Apollo program was NASA's instrument. For solution of Apollo's guidance and control problems, NASA turned to the Instrumentation Laboratory at MIT."

Dr. Draper described a tremendously important sequence of events in these words:

"The Apollo guidance and navigation system is a lineal descendant of developments in gyroscopic instruments started in support of our military services during the 1930's. These developments became machine gun sights to protect naval ships from multiple airplane attacks during World War II. They controlled the bullets of Air Force fighters during the Korean War. The pattern of mechanization established for these devices provided the basis of inertial navigation developments for flying machines and submarines during the post-war decade from 1945-1955. This pattern was adapted

to the needs of Thor, Titan, and Polaris missiles. When rocket powered vehicles became important for national defense, the Guidance and Navigation System in the Apollo program established a pattern of man-machine cooperation for accurate and very reliable control of flying vehicles that is suitable for craft of all kinds, and is even now being introduced into the fleets of commercial air transport companies.

"In addition to system arrangements designed to achieve optimum effectiveness from human pilots whose job it is today to monitor and control complex systems made up of gyros, accelerometers, computers, indicators, and program selectors, NASA has looked ahead and inspired and supported important pioneering developments of even more advanced inertial sensors to meet future requirements.

"There are nearing completion and will soon bring into existence high performance instrument components that will add significantly to our capabilities for national defense. They will also add to the profits of commercial transport companies. These and other benefits will surely be great -- perhaps so great that they will represent a considerable fraction of the total cost of the Apollo program."

To let our ladies understand more of what kind of space machines need these very accurate guidance systems, let me briefly give you a few facts on the Saturn Apollo system, which weighs six million pounds at takeoff:

1. First stage burns 2300 tons in 2-1/2 minutes and speeds the Apollo up to 5,000 mph.
2. Second stage burns seven minutes and speeds Apollo up to 16,000 mph.
3. Third stage adds 2,000 mph and shuts down to be used later to get up to 25,000 mph -- necessary to escape the earth's gravity.

All in all, Apollo starts with six million pounds and ends up in orbit with 280,000 pounds of payload. Such a large payload in earth orbit can do its work and show its power over every nation. It is not subject to the limits of machines on the earth, on the sea, or in the air. No engine has to run and no fuel is consumed and no natural boundary or concept of sovereignty can limit its operations. These vehicles are in reality a new element of power. There are many additional requirements for the use of rocket power, under very accurate control, over and above the ability to proceed outward to the moon, land, and return. In fact, it is not the landing that is the objective but the capability to do any work our nation needs to do in space. This capability is what NASA and its partners like the Navy have developed in this first ten years I have described. How this capability is to be used, what needs it must

meet, are tasks for the future. But in looking to the future, we must look at more than space, and more than we have heretofore seen in the ocean depths.

All friends of the Navy know that there is emerging today a concept that through modern technology, we can open the vast reaches of a new frontier, a frontier of new uses for those great regions beyond our borders that lie under the sea, in the air and in space. Many elements of this concept are little known and yet they offer very great opportunities. As a nation, we are seeking to develop these resources and capabilities for peaceful purposes for the benefit of mankind. We have subscribed to such concepts as freedom of the seas, atoms for peace, and the peaceful exploration of the Antarctic and of space. We want our technology to achieve power to open new frontiers together with other nations and peoples. But friends of the Navy also know that in this endeavor we must relate our civilian research and development efforts to our military needs if we are to ensure for our national security the technological and other capabilities, and the forward thrusting posture that will enable us to meet whatever conditions may arise. We cannot escape the fact that our efforts toward peaceful cooperation may not be immediately and in all cases successful.

In our nation's pioneering on new frontiers, our Navy is contributing much, and I believe gaining much, through its close working relationships with NASA. NASA is an even larger

beneficiary. But the real gainer is the nation, because nothing is more important than the effective conduct of research and development and its rapid translation into improved operational capability in services like our Navy. The technological balance of power among nations is today a major factor in national security decisions.

In closing, let me say thanks for the kind words for NASA and for my period as Administrator. I am happy to go to the coach's bench and have Tom Paine, a good Navy-trained man, lead the team on the playing field. He is a second-generation Navy man -- an experienced submariner -- now in aeronautics and space. He has 19 years of business experience and six months as a senior NASA executive. He has recently been joined by Jim Beggs and Phil Whittaker, both also experienced in business. Beggs is also a Navy-trained man. So these men will join with many already at NASA and will do the job ahead, and the Navy will be an even closer member of the space family and NASA will undoubtedly become an even closer member of the oceanography team.

Thank you very much.